having two quantum well structures stacked over each other and each comprising a plurality of alternating barrier layers and well layers [a barrier layer and a well layer], each well layer of each quantum well structure [photodetector] coupled between two barrier layers[, each well having a well bottom, and a well top, and each well supporting] to support an intersubband transition between a bound ground energy state and an excited energy state within a common energy band where said excited energy state is substantially resonant with an energy of the well top [states therein];

[materials and thicknesses of said photodetector element being selected such that a bound excited state energy is substantially resonant with said well top; and

said photodetectors including a first group and a second group] wherein the materials, thicknesses and dimensions of said [wells and barriers] well layers and barrier layers are selected such that said quantum well structures effect intersubband transitions at first and second wavelengths, respectively, well layers of one quantum well structure including GaAs and well layers of another quantum well structure including InGaAs, wherein none of said two quantum well structures is short circuited [the peak intersubband absorption is at a first wavelength of electromagnetic radiation for the first group and

the peak intersubband absorption is at a second wavelength for the second group.]

3. (Amended) A QWIP as in claim 1 [2] wherein said [first group and said second group of photodetectors] two quantum well structures in each photodetector are separated by an intermediate contact layer.

4. (Amended) A QWIP as in claim 3 wherein [said wells in the first group are formed of GaAs, said wells in the second group are formed of $In_xGa_{1-x}As$ and] said barriers in both quantum well structures [groups] are formed of $Al_xGa_{1-x}As$.

9. (Amended) The QWIP as in claim 1 [8] further comprising a multiplexer coupled to [said] each photodetector in said array and generating a stream of data [from the first group of photodetectors followed by] caused by radiation at said first wavelength and a stream of data caused by radiation at said second wavelength, [selectively from the first and second groups of photodetectors, whereby separate] so as to separately form images of the first and second wavelengths [wavelength can be formed from said data].

11. (Amended) A QWIP as in claim 1 [10] further comprising a continuum transport band, carrying a photocurrent from said wells, wherein the continuum transport band has a smooth energy level profile between wells in said two quantum well strcutures [the first and second groups of photodetectors].

12. (Amended) A QWIP as in claim 11 wherein said barriers in one of said two quantum well structures [the second group] have a barrier height equal to that of the barriers in the other one of said two quantum well structures [first group].

13. (Amended) A QWIP as in claim 12 wherein [the photodetectors in the first group and in the second group have barriers] each barrier is formed of a material including aluminum, wherein the aluminum mole ratio is the same for the barriers in both quantum well structures [groups].

14. (Amended) A photodetector as in claim 1 further comprising a random reflector formed on said substrate to reflect incident radiation to said photodetectors [first and second gratings facing the first and second groups of photodetectors, respectively, such that the first gratings transmit primarily the

first wavelength and the second grating transmits primarily the second wavelength of electromagnetic radiation].

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15. (Amended) A QWIP as in claim 1 [10] wherein said barrier layers are made of $Al_xGa_{1-x}As$, and said second group of wells are formed of $Al_yGa_{1-y}As$ where x is not equal to y.

16. (Amended) A photodetector as in claim 1 wherein said excited energy state is substantially resonant with an energy of the well top and has a deviation from said well top by less than about 2% of the well top[15 wherein said first and second groups of photodetectors and said first and second gratings are arranged in an array].

17. (Amended) A quantum well infrared photodetector comprising:

a substrate formed of a semiconductor material;

a plurality of photodetectors disposed relative to one another to form an array on said substrate, each photodetector formed of alternating quantum wells of a first type and a second type with different active layers stacking to one another [having a barrier layer and well layer, each well layer of each photodetector coupled between two barrier layers, each well

having a well bottom, and a well top, and each well supporting bound energy states therein];

each well having a ground bound state and an excited state energy level [and a thermionic emission energy level and wherein said excited state energy level is] approximately equal to [the] a thermionic energy level of said well to effect an intersubband absorption and said quantum wells of said first type including InGaAs and absorbing photons of a first wavelength and said quantum wells of said second type including GaAs and absorbing photons at a second wavelength different from said first wavelength, wherein none of said quantum wells is short circuited [whereby the wells exhibit intersubband absorption; and

said photodetectors including a first and a second group of photodetectors, wherein the wells are configured such that said excited state energy level for the wells in the first group is different from the excited state energy level of the wells in the second group].

18. (Amended) A QWIP as in claim 1 [17] further comprising a continuum energy level between adjacent wells and carrying excited charge carriers, wherein said excited energy state is at a position such that the excited carriers can escape